$$RE_k = \frac{\sum_{t_j \geq t_k - T} d_j}{T}$$

FIG. 1

$$RE_{k-1} = \frac{\sum_{t_j \geq t_{k-1} - T} d_j}{T}$$

FIG. 2

$$RE_k = RE_{k-1} + \frac{d_k - \sum_{t_j <= t_k - T, t_i > t_{k-1} - T} d_j}{T}$$

FIG. 3

$$\hat{RE}_k = \frac{19}{21} R\hat{E}_{k-1} + \frac{1}{21}(RE_k + RE_{k-1})$$

FIG. 4

```
if (3 DUPACKs are received)                                    ~502  ~506  ~504
500 ~if (cwin/ ((RE * RTTmin) / seg_size) >θ) /*Congestion condition*/
    505 ~ssthresh = (RE* RTTmin) / seg_size;
        else /* no congestion */                                    ~508
        507 ~ssthresh = (BE * RTTmin) / seg_size;
        endif
509 ~if (cwin > ssthresh) /* congestion avoid. */
                cwin = ssthresh;
        endif
endif
```

FIG. 5

```
if (3 DUPACKs are received)                    600
        ssthresh = (ABSE * RTTmin) / seg_size;
        if (cwin > ssthresh) /* congestion avoid. */
                cwin = ssthresh;
        endif
endif
```

In case a packet loss is indicated by a timeout expiration, *cwin* and *ssthresh* are set as follows:

```
if (coarse timeout expires)                    602
        cwin = 1;                              604  606
        ssthresh = (ABSE * RTTmin) / seg_size;
        if (ssthresh < 2)
                ssthresh = 2;
        endif;
endif
```

FIG. 6

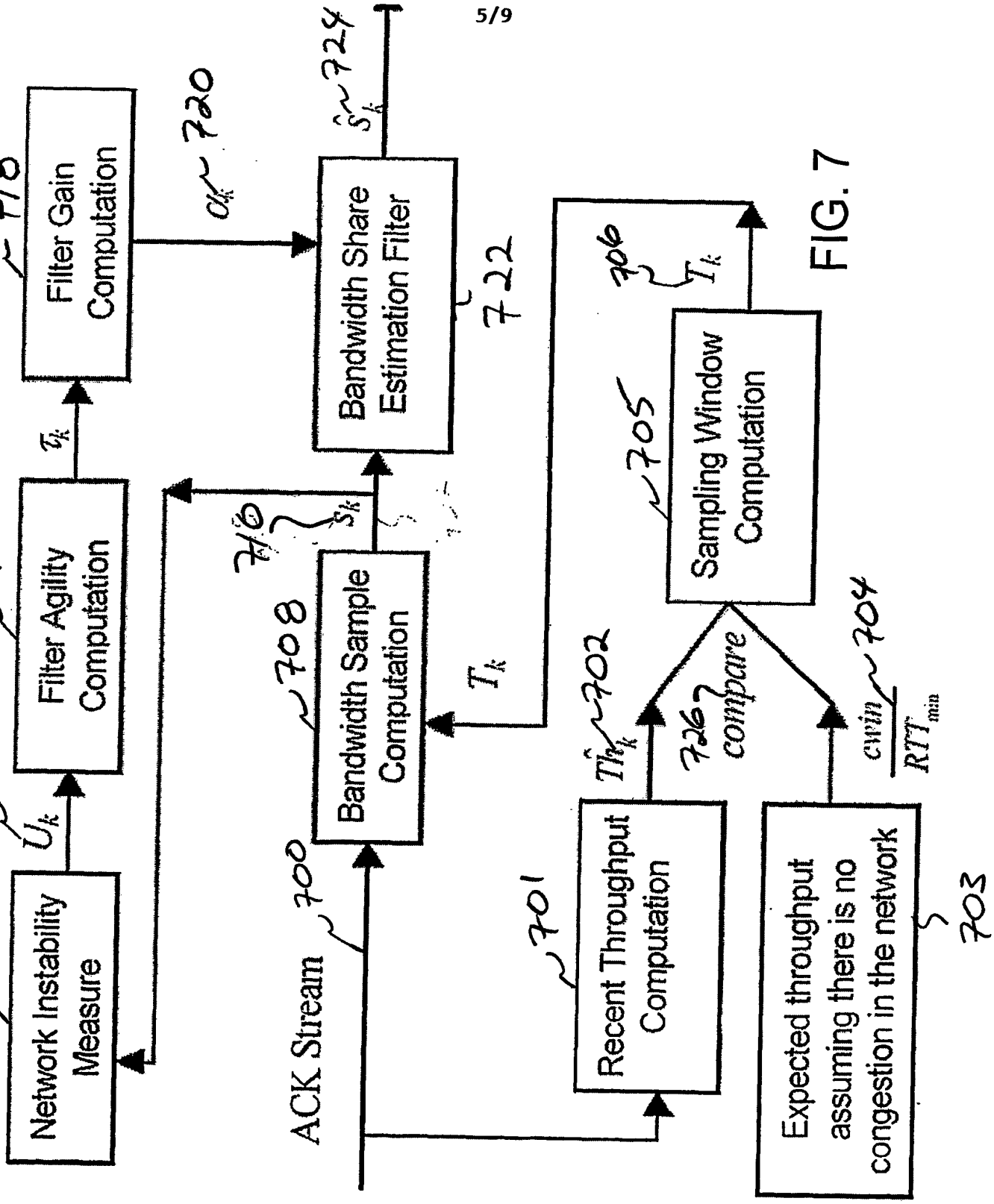
Network Instability Measure
712
U_k
Filter Agility Computation
714
τ_k
Filter Gain Computation
718
α_k
720
Bandwidth Share Estimation Filter
722
$\hat{s}_k$
724
s_k
716
Bandwidth Sample Computation
708
ACK Stream
700
T_k
Recent Throughput Computation
701
$\hat{Th}_k$
702
726
compare
Sampling Window Computation
705
706
T_k
Expected throughput assuming there is no congestion in the network
703
$\frac{cwin}{RTT_{min}}$
704

FIG. 7

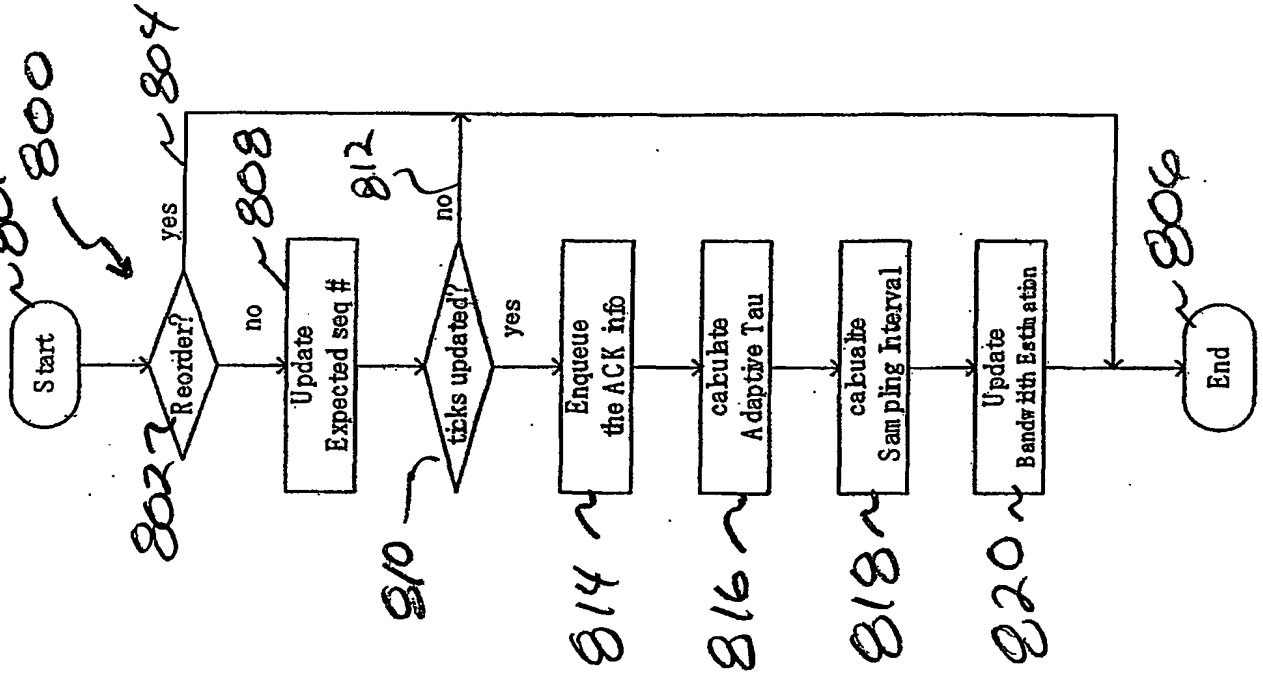
Start
801
800
Reorder?
802
yes
804
no
Update Expected seq #
808
ticks updated?
810
no
812
yes
Enqueue the ACK info
814
calculate Adaptive Tau
816
calculate Sampling Interval
818
Update Bandwith Estimation
820
End
806

FIG. 8

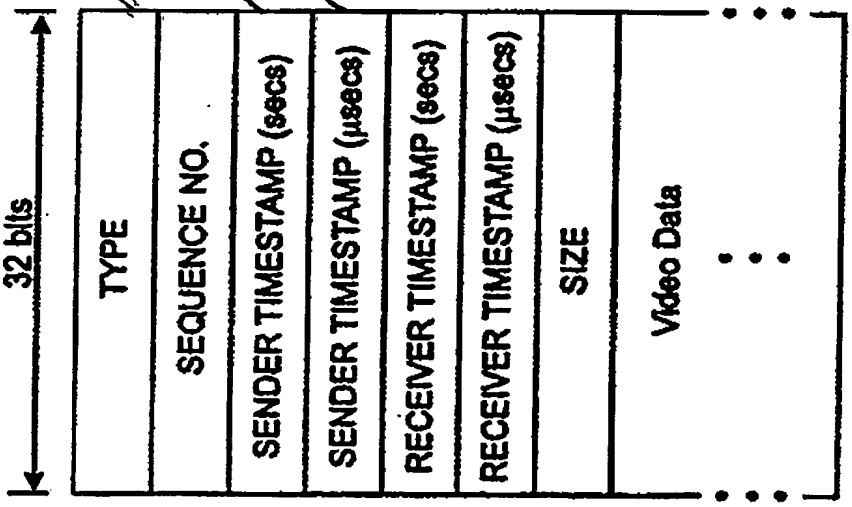
32 bits
TYPE
SEQUENCE NO.
SENDER TIMESTAMP (secs)
SENDER TIMESTAMP (µsecs)
RECEIVER TIMESTAMP (secs)
RECEIVER TIMESTAMP (µsecs)
SIZE
Video Data
900
902
904

FIG. 9

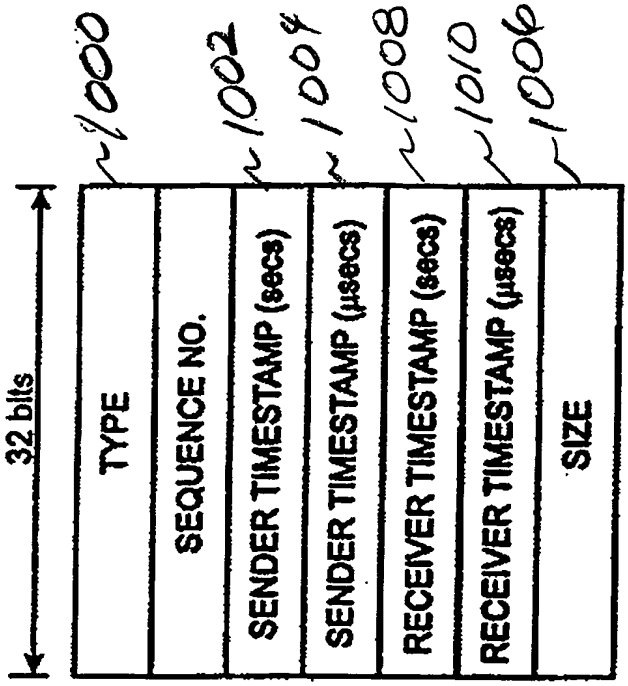
32 bits
TYPE
SEQUENCE NO.
SENDER TIMESTAMP (secs)
SENDER TIMESTAMP (µsecs)
RECEIVER TIMESTAMP (secs)
RECEIVER TIMESTAMP (µsecs)
SIZE
1000
1002
1004
1008
1010
1006

FIG. 10

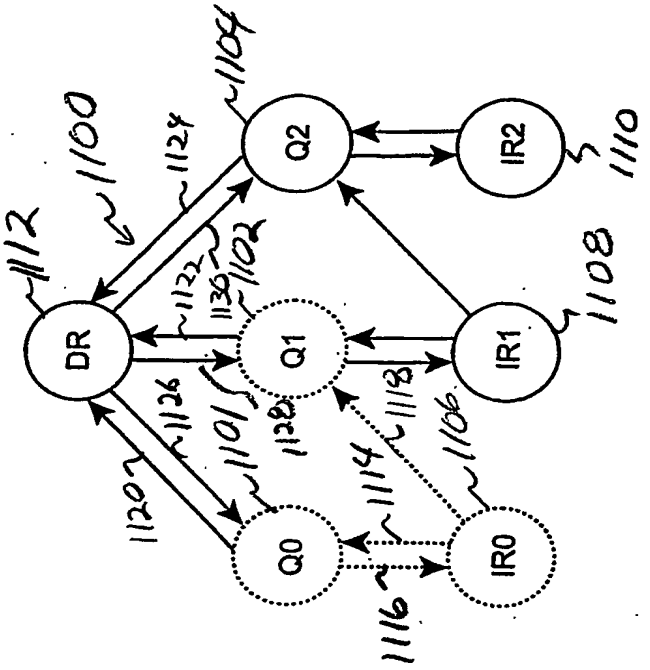
DR
Q2
IR2
Q1
IR1
Q0
IR0
1100
1102
1104
1106
1108
1110
1112
1114
1116
1120
1122
1124
1126
1128
1130

FIG. 11

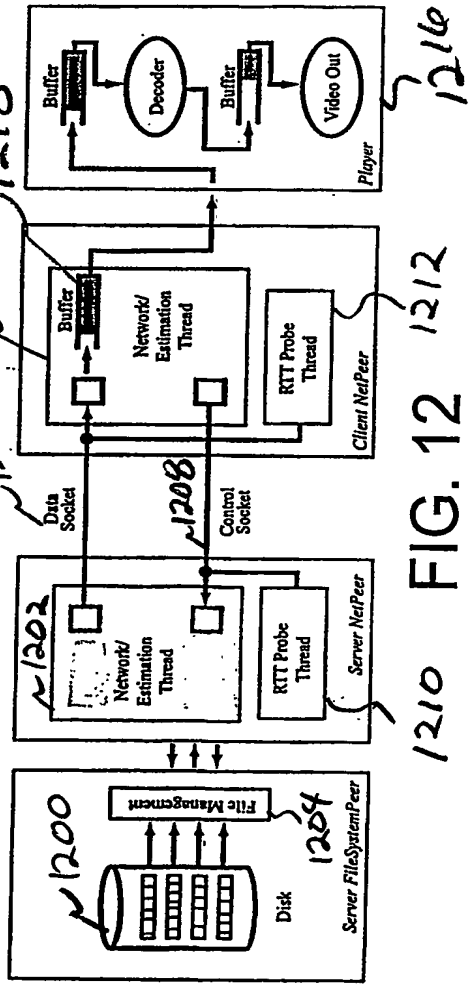
Buffer
Decoder
Buffer
Video Out
Player
1216
1218
1214
Buffer
Network/ Estimation Thread
RTT Probe Thread
Client NetPeer
1212
1206
Data Socket
1208
Control Socket
1202
Network/ Estimation Thread
RTT Probe Thread
Server NetPeer
1210
File Management
1204
1200
Disk
Server FileSystemPeer

FIG. 12

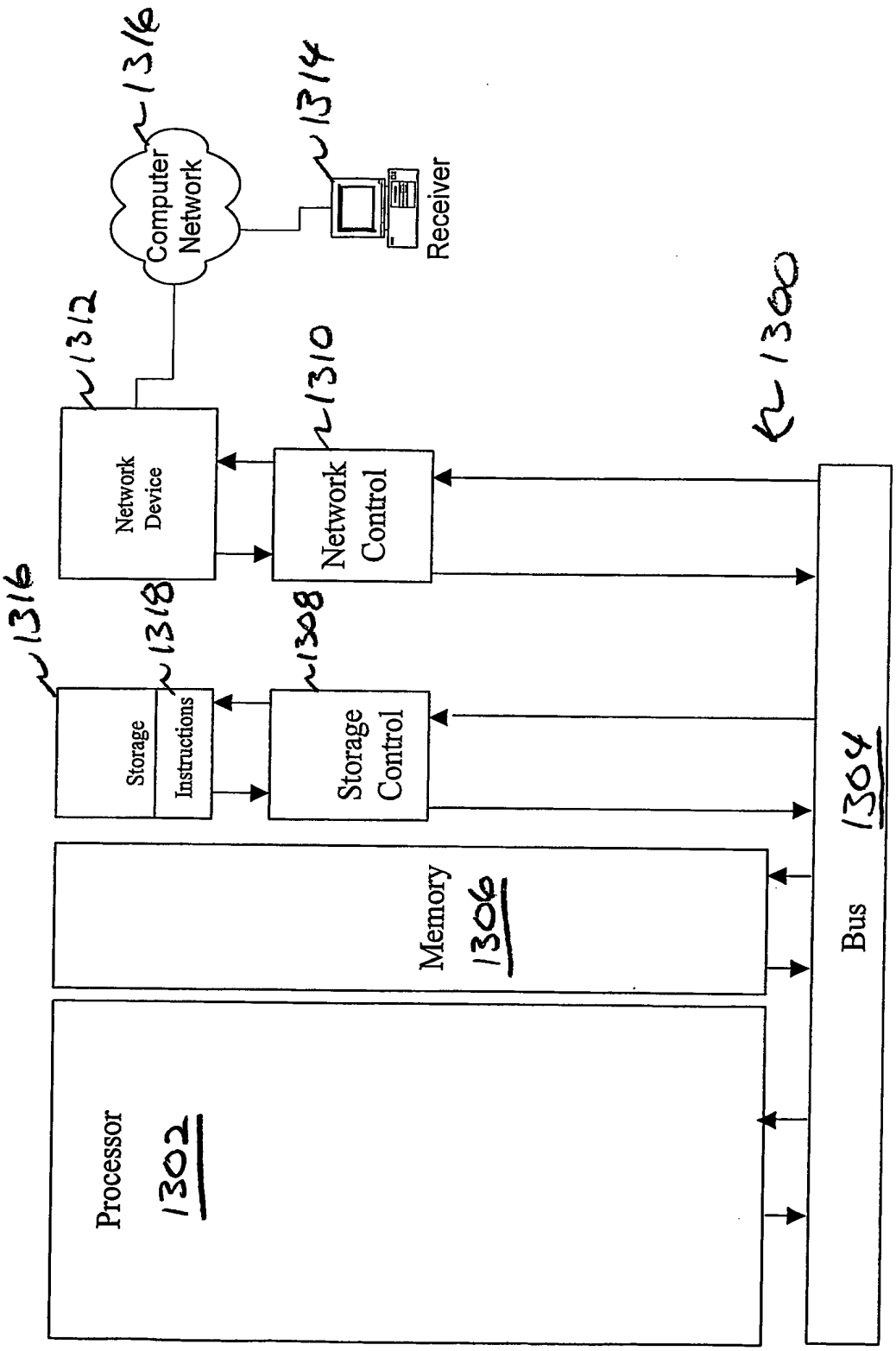
1316
1314
Computer Network
Receiver
1312
1310
1300
Network Device
Network Control
1316
1318
1308
Storage
Instructions
Storage Control
Memory
1306
Bus
1304
Processor
1302

FIG. 13